REMARKS

The Examiner's Action mailed on December 28, 2007, has been received and its contents carefully considered.

In this Amendment, Applicants have editorially amended the specification, amended claims 1, 5 and 6, and cancelled claims 4 and 7 without prejudice. Claims 1 and 5 are the independent claims, and claims 1-3, 5 and 6 remain pending in the application. For at least the following reasons, it is submitted that this application is in condition for allowance.

Claims 1, 2 and 4-6 were rejected under 35 USC §102(b) as anticipated by *Ota et al.* (EP 1014520 A1). This rejection is respectfully traversed.

Independent claim 1 as amended recites "*a metal layer portion* provided on a layer that is *above the substrate and under the active layer* on a resonance cavity end face and in a vicinity thereof", and independent claim 5 as amended similarly recites "forming *a metal layer portion* by melting a part of the semiconductor lamination portion, the part being *above the substrate and under the active layer*" (*emphasis added*).

The present invention has as an object preventing cases in which cracks generated on the substrate at the time of cleavage extend to the active layer of the resonator end face, resulting in increased absorption loss, which in turn leads to degradations in laser characteristics. In a preferred embodiment, a metal layer portion for absorbing cracks, which are generated on the substrate or the joint surface with the substrate, is provided on a layer that is <u>above the substrate and</u>

under the active layer, which is spaced from the substrate, so as to prevent the cracks from reaching the active layer at the end face. In other words, for reliably preventing also cracks that are generated during cleavage at the joint surface between the substrate and the semiconductor layer that is to be laminated thereon, the metal layer needs to be formed on the active layer side rather than the joint surface (interface). With this arrangement, it is possible to reliably protect the active layer at the resonator end face from extensions of cracks.

On the other hand, *Ota et al.* is directed to the problem that, due to the presence of a shift in crystalline surfaces between a sapphire substrate and a semiconductor (GaN) layer to be laminated, the GaN layer to he laminated cannot be smoothly cleaved. *Ota et al.* discloses a method for obtaining a smooth cleavage surface on the GaN layer, in which laser beams are irradiated onto an interface of the substrate and the GaN layer in a vicinity of the cleavage face for forming a decomposed region of the GaN layer and partially breaking a crystal bond between the sapphire substrate and the GaN layer (see ¶0034):

> The group III nitride semiconductor laser of the embodiment has a decomposed-matter area **150** of a nitride semiconductor disposed at the interface between the sapphire substrate **101** and its crystal layer **103** and having a cleavage plane for resonance i.e., (1-100) plane intersecting the superimposed crystal layers **102** to **110**. The decomposed-matter area **150** of the nitride semiconductor is formed by a light beam applied to the interface from the substrate side. In the decomposed-matter area **150** of nitride semiconductor formed by laser-beam irradiation, the crystal bond between a sapphire substrate and GaN crystal is locally broken. Therefore, a layered portion of GaN nearby a reflector over the decomposed-matter area **150** ideally cracks along the crystallographic cleavage plane of GaN without influence of the fracture of sapphire substrate in the mirror facet forming step. The wavelength of applied laser beam is selected from wavelengths absorbed by a GaN crystal layer and passing through the sapphire

> substrate. Absorbed light in the GaN crystal layer near the interface is almost converted into heat where many crystal defects are present. The temperature of the laser-beam applied area of a crystal layer nearby the sapphire substrate rapidly rises and GaN is decomposed into gallium and nitrogen.

In other words, *Ota et al.* is directed at breaking the bond between the sapphire substrate and the GaN layer. Therefore, it may happen that cracks generated on the GaN layer side of the joint surface might extend to the active layer side to cause degradations in the active layer, and thus *Ota et al.* is completely different from the present invention in which extensions of cracks are absorbed and blocked <u>by providing a metal layer on the active layer side</u> rather than the joint surface.

More specifically, the Office Action alleges with respect to original (cancelled) claim 4 that buffer layer **102** of *Ota et al.* constitutes the claimed "metal layer", but buffer layer **102** is made of either GaN or AlN, so it is a nitride layer, not a metal layer. See, for example, ¶¶[0033] and [0036] of *Ota et al.*:

> FIG. 4 shows the group III nitride semiconductor laser of an embodiment. *The semiconductor laser device is constituted of a GaN (or AlN) layer **102*** formed at a low temperature, n-type GaN layer **103**, n-type $Al_{0.1}Ga_{0.9}N$ layer **104**, n-type GaN layer **105**, active layer **106** mainly containing InGaN, p-type $Al_{0.2}Ga_{0.8}N$ layer **107**, p-type GaN layer **108**, p-type $Al_{0.1}Ga_{0.9}N$ layer **109**, and p-type GaN layer **110** which are stacked on the single-crystal sapphire substrate **101** in order. An n-side electrode **114** and p-side electrodes **113** and **115** are connected to the n-type GaN layer **103** and p-type GaN layer **110**. A ridge stripe portion **118** is formed on the p-type $Al_{0.1}Ga_{0.9}N$ layer **109**. The device is covered with and protected by an insulating film **111** made of SiO_2 except electrodes.

> The n-type GaN layer **103** is a ground layer formed as a current path because sapphire serving as a substrate does not have any electric conductivity at all. Moreover, *the GaN (or AlN) layer **102** formed as a low temperature growth layer*

is a so-called buffer layer that is formed to give a smoothing film on the sapphire substrate that is a different material for GaN.

(*emphasis added*)

As buffer layer **102** is a nitride layer and not a metal layer, it is immaterial that it is located below active layer **106**. Nor do either FIG. 4 or FIG. 10 of *Ota et al.* show any metal layer "above the substrate and under the active layer". Electrodes **113** and **115** are above the active layer **106**, and electrode **114** lies in an area that is not covered by active layer **106**.

Ota et al. therefore fails to teach or suggest "a metal layer portion" that is "above the substrate and under the active layer" as recited in independent claims 1 and 5.

Consequently, claims 1 and 5 patentably distinguish over *Ota et al.* and are thus allowable, together with claims 2 and 6 that depend respectively therefrom, claim 4 having been cancelled.

Claims 3 and 7 were rejected under 35 USC §103(a) as obvious solely over *Ota et al.* This rejection is respectfully traversed.

Claim 3 depends from claim 1, and is therefore allowable for at least the same reasons that claim 1 is allowable, and claim 7 has been cancelled.

It is submitted that this application is in condition for allowance. Such action and the passing of this case to issue are requested.

Should the Examiner feel that a conference would help to expedite the prosecution of this application, the Examiner is hereby invited to contact the undersigned counsel to arrange for such an interview.

Should any fee be required, however, the Commissioner is hereby authorized to charge the fee to our Deposit Account No. 18-0002, and advise us accordingly.

Respectfully submitted,

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Date

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